General

Guideline Title

Treatment of subaxial cervical spinal injuries. In: Guidelines for the management of acute cervical spine and spinal cord injuries.

Bibliographic Source(s)

Gelb DE, Aarabi B, Dhall SS, Hurlbert RJ, Rozzelle CJ, Ryken TC, Theodore N, Walters BC, Hadley MN. Treatment of subaxial cervical spinal injuries. In: Guidelines for the management of acute cervical spine and spinal cord injuries. Neurosurgery. 2013 Mar;72(Suppl 2):187-94. [30 references] PubMed

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

The rating schemes used for the strength of the evidence (Class I-III) and the levels of recommendations (Level I-III) are defined at the end of the "Major Recommendations" field.

Recommendations

Level III

- Closed or open reduction of subaxial cervical fractures or dislocations is recommended. Decompression of the spinal cord/restoration of the spinal canal is the goal.
- Stable immobilization by either internal fixation or external immobilization to allow for early patient mobilization and rehabilitation is recommended. If surgical treatment is considered, either anterior or posterior fixation and fusion is acceptable in patients not requiring a particular surgical approach for decompression of the spinal cord.
- Treatment of subaxial cervical fractures and dislocations with prolonged bed rest in traction is recommended if more contemporary treatment options are not available.
- The routine use of computed tomography (CT) and magnetic resonance imaging (MRI) of trauma victims with ankylosing spondylitis (AS) is recommended, even after minor trauma.
- For patients with AS who require surgical stabilization, posterior long-segment instrumentation and fusion or a combined dorsal and anterior procedure is recommended. Anterior standalone instrumentation and fusion procedures are associated with a failure rate of up to 50% in these patients.

Summary

Subaxial cervical spine fractures and dislocations encompass a broad spectrum of acute traumatic injuries. Adequate decompression of the neural elements and the restoration of sufficient spinal stability to allow early mobilization and rehabilitation remain basic treatment tenets. Although nonsurgical treatment can be employed successfully, surgical treatment of these injuries achieves these goals more consistently and more quickly, especially in higher grades of injury. Both anterior and posterior surgical approaches have been reported as effective. Neither approach is necessarily superior to the other as long as the goals of treatment can be accomplished. Treatment must be individualized on the basis of the specific characteristics of each particular injury. Factors to be considered include neurologic status, the degree and type of bony and/or ligamentous disruption, and the degree and cause of spinal cord compression. The treatment of patients with AS who sustain traumatic subaxial cervical spinal fractures is challenging and has a comparatively high associated morbidity and mortality, regardless of the treatment offered or the surgical approach used.

Definitions:

Rating Scheme for the Strength of the Evidence: Modified North American Spine Society Schema to Conform to Neurosurgical Criteria as Previously Published and for Ease of Understanding and Implementation: Levels of Evidence for Primary Research Question[a]

Class	Therapeutic Studies: Investigating the Results of Treatment	Diagnostic Studies: Investigating a Diagnostic Test	Clinical Assessment: Studies of Reliability and Validity of Observations, Including Clinical Examination, Imaging Results, and Classifications
I	High-quality randomized controlled trial with statistically significant difference or no statistically significant difference but narrow confidence intervals	Testing of previously developed diagnostic criteria on consecutive patients (with universally applied reference "gold" standard)	Evidence provided by 1 or more well-designed clinical studies in which interobserver and intraobserver reliability is represented by a Ä, statistic ≥0.60 or an intraclass correlation coefficient of ≥0.70
	Systematic review[b] of Class I randomized controlled trials (and study results were homogeneous[c])	Systematic review[b] of Class I studies	
II	Lesser-quality randomized controlled trial (e.g., <80% follow-up, no blinding, or improper randomization)	Development of diagnostic criteria on consecutive patients (with universally applied reference "gold" standard)	Evidence provided by 1 or more well-designed clinical studies in which interobserver and intraobserver reliability is represented by a Ä, statistic of 0.40–0.60 or an intraclass correlation coefficient of 0.50–0.70
	Prospective[d] comparative study[e]	Systematic review[b] of Class II studies	
	Systematic review[b] of Class II studies or Class I studies with inconsistent results	Study of nonconsecutive patients; without consistently applied reference "gold" standard	
	Case-control study[g]	Systematic review[b] of Class III studies	
	Retrospective[f] comparative study[e]	Case-control study	
	Systematic review[b] of Class II studies		
III	Case series[h]	Poor reference standard	Evidence provided by 1 or more well-designed clinical studies in which interobserver and intraobserver reliability is represented by a Ä, statistic of <0.40 or an intraclass correlation coefficient of <0.50
	Expert opinion	Expert opinion	

[a]A complete assessment of quality of individual studies requires critical appraisal of all aspects of the study design.

[b]A combination of results from 2 or more prior studies.

[c]Studies provided consistent results.

[d]Study was started before the first patient enrolled.

[e]Patients treated 1 way (e.g., halo vest orthosis) compared with a group of patients treated in another way (e.g., internal fixation) at the same institution.

[f]The study was started after the first patient was enrolled.

[g]Patients identified for the study on the basis of their outcome, called "cases" (e.g., failed fusion), are compared with those who did not have outcome, called "controls" (e.g., successful fusion).

[h]Patients treated 1 way with no comparison group of patients treated in another way.

Levels of Recommendation

Level I	Generally accepted principles for patient management, which reflect a high degree of clinical certainty (usually this requires Class I evidence which directly addresses the clinical questions or overwhelming Class II evidence when circumstances preclude randomized clinical trials)
Level II	Recommendations for patient management which reflect moderate clinical certainty (usually this requires Class II evidence or a strong consensus of Class III evidence)
Level III	Other strategies for patient management for which the clinical utility is uncertain (inconclusive or conflicting evidence or opinion)

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Subaxial cervical spinal injuries (fractures and dislocations), including injuries occurring in ankylosing spondylitis

Guideline Category

Management

Treatment

Clinical Specialty

Neurological Surgery

Orthopedic Surgery

Intended Users

Physicians

Guideline Objective(s)

To provide a contemporary analysis of anterior and posterior surgical techniques in the treatment of subaxial cervical spinal fractures and dislocation injuries

Target Population

- Patients with acute subaxial cervical spine injuries following trauma

- Trauma victims with ankylosing spondylitis (AS)

Interventions and Practices Considered

1. Closed or open reduction
2. Stable immobilization by internal fixation (anterior or posterior) and fusion
3. External immobilization
4. Prolonged bed rest in traction
5. Computed tomography (CT) and magnetic resonance imaging (MRI) in trauma victims with ankylosing spondylitis (AS)
6. Posterior long-segment instrumentation and fusion or a combined dorsal and anterior procedure for patients with AS

Major Outcomes Considered

- Fusion rate
- Postoperative complication rate
- Instrumentation failure
- Radiographic and neurologic outcomes
- Morbidity and mortality
- Hospital stay

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Search Criteria

A National Library of Medicine (PubMed) computerized literature search was performed in a fashion similar to the one that formed the basis of the previous guideline on this topic. The search consisted of publications from1966 through 2011 using the following headings limited to the English language: "cervical vertebrae," "spinal fractures," and "dislocations," leading to 8684, 5810, and 9450 citations, respectively. The first heading was combined with the second 2 headings, leading to a subset of 1,118 and 466 citations, respectively. Another search of "therapeutics" or "treatment" limited to the English language led to 1,870,663 citations. This was combined with each of the 2 prior subsets, leading to 856 citations with abstracts. These abstracts were reviewed, and only those containing 10 or more cases of subaxial cervical injury after nonpenetrating cervical trauma were included.

Number of Source Documents

Twenty-eight articles met the selection criteria and provide the basis for this updated review. They are summarized in Evidentiary Table format (see Tables 1 and 2 in the original guideline document).

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Rating Scheme for the Strength of the Evidence: Modified North American Spine Society Schema to Conform to Neurosurgical Criteria as Previously Published and for Ease of Understanding and Implementation: Levels of Evidence for Primary Research Question[a]

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Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Selected articles were carefully reviewed by the authors. Evidentiary tables were created (refer to Tables 1 and 2 in the original guideline document) that reflected the strengths and weaknesses of each article.

On occasion, the assessed quality of the study design was so contentious and the conclusions so uncertain that the guideline authors assigned a lower medical evidence classification than might have been expected without such a detailed review. In every way, adherence to the Institute of Medicine's criteria for searching, assembling, evaluating, and weighing the available medical evidence and linking it to the strength of the recommendations presented in this document was carried out.

Articles that did not achieve immediate consensus among the author group were discussed extensively until a consensus was reached. Very few contributions required extensive discussion. Most articles were easily designated as containing Class I, II, or III medical evidence using the criteria set forth by the author group at the initiation of the literature evaluation process (see the "Rating Scheme for the Strength of the Evidence" field).

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

The current author group was selected for its expertise in spinal surgery (both neurosurgical and orthopedic), neurotrauma, clinical epidemiology, and, in several cases, prior experience with guideline development. The topics chosen for inclusion in this iteration of these guidelines are contemporary and pertinent to the assessment, evaluation, care, and treatment of patients with acute cervical spine and/or spinal cord injuries.

Rating Scheme for the Strength of the Recommendations

Levels of Recommendation

Level I	Generally accepted principles for patient management, which reflect a high degree of clinical certainty (usually this requires Class I evidence which directly addresses the clinical questions or overwhelming Class II evidence when circumstances preclude randomized clinical trials)
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Level III	Other strategies for patient management for which the clinical utility is uncertain (inconclusive or conflicting evidence or opinion)

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Not stated

Description of Method of Guideline Validation

Not applicable

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field). All of the articles provided Class III medical evidence.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate treatment of subaxial cervical spinal injuries to restore sufficient spinal stability and allow early mobilization and rehabilitation

Potential Harms

Reported instrumentation-related and other postoperative complications include:

- Instrumentation failure
- Neurological deterioration
- Pulmonary infection
- Wound infection
- Vertebral artery injury
- Radiculopathy
- Persistent moderate to severe neck pain
- Loss of correction
- Mortality

Refer to the original guideline document for more information regarding potential harms.

Qualifying Statements

Qualifying Statements

- Medical evidence-based guidelines are not meant to be restrictive or to limit a clinician's practice. They chronicle multiple successful treatment options (for example) and stratify the more successful and the less successful strategies based on scientific merit. They are not absolute, "must be followed" rules. This process may identify the most valid and reliable imaging strategy for a given injury, for example, but because of regional or institutional resources, or patient co-morbidity, that particular imaging strategy may not be possible for a patient with that injury. Alternative acceptable imaging options may be more practical or applicable in this hypothetical circumstance.
- Guidelines documents are not tools to be used by external agencies to measure or control the care provided by clinicians. They are not medical-legal instruments or a "set of certainties" that must be followed in the assessment or treatment of the individual pathology in the individual patients we treat. While a powerful and comprehensive resource tool, guidelines and the recommendations contained therein do not necessarily represent "the answer" for the medical and surgical dilemmas faced with many patients.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Mobile Device Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Identifying Information and Availability

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Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2013 Mar

Guideline Developer(s)

American Association of Neurological Surgeons - Medical Specialty Society

Congress of Neurological Surgeons - Professional Association

Source(s) of Funding

Congress of Neurological Surgeons

Guideline Committee

Guidelines Author Group of the Joint Section of Disorders of the Spine and Peripheral Nerves of the American Association of Neurological Surgeons and the Congress of Neurological Surgeons

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Financial Disclosures/Conflicts of Interest

The authors have no personal financial or institutional interest in any of the drugs, materials, or devices described in this guideline.

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available in Portable Document Format (PDF) and EPUB for eBook devices from the Neurosurgery Web site .

Availability of Companion Documents

The following are available:

- Foreword. Guidelines for the management of acute cervical spine and spinal cord injuries. Neurosurgery 2013;72(3):1. Electronic copies: Available in Portable Document Format (PDF) from the Neurosurgery Web site .
- Commentary. Guidelines for the management of acute cervical spine and spinal cord injuries. Neurosurgery 2013;72(3):2-3. Electronic copies: Available in PDF from the Neurosurgery Web site .
- Introduction to the guidelines for the management of acute cervical spine and spinal cord injuries. Neurosurgery 2013;72(3):5-16. Electronic copies: Available in PDF from the Neurosurgery Web site .
- Methodology of the guidelines for management of acute cervical spine and spinal cord injuries. Neurosurgery 2013;72(3):17-21. Electronic copies: Available in PDF from the Neurosurgery Web site .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on July 9, 2013. The information was verified by the guideline developer on October 3, 2013.

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